This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: F3361 – 18ε1

# Standard Guide for Classifying Alterations for In-Service Aircraft under FAA Authority Oversight[1]

This standard is issued under the fixed designation F3361; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

ε[1] NOTE—Section references in Fig. 2 were corrected editorially in August 2019.

## 1. Scope

1.1 This guide is intended for Part 23 and predecessor aircraft (see Civil Air Regulations (CAR) 3) and:

1.1.1 Is applicable to aircraft to which Part 43 applies.

1.1.2 Addresses both initial installation and replacement of aircraft articles.

1.1.3 Is a guide for classifying an alteration.

1.1.4 The intended audience of this guide is individuals who have been tasked with evaluating alterations for the purpose of categorizing an alteration for the purpose of satisfying the regulations.

1.1.5 Is an alteration to an article.

1.2 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.3 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

## 2. Referenced Documents

2.1 *Code of Federal Regulations:*[2]

14 CFR Aeronautics and Space, Vol 1, Chapter I, Subchapter A, Part 1 Definitions and Abbreviations, including Amendments 1-1 through 1-69

14 CFR Aeronautics and Space, Vol 1, Chapter I, Subchapter C, Part 21 Certification Procedures for Products and Articles, including Amendments 21-1 through 21-100

14 CFR Aeronautics and Space, Vol 1, Chapter I, Subchapter C, Part 23 Airworthiness Standards: Normal, Utility, Acrobatic, and Commuter Category Airplanes

14 CFR Aeronautics and Space, Vol 1, Chapter I, Subchapter C, Part 43 Maintenance, Preventive Maintenance, Rebuilding, and Alteration, including Amendments 43-1 through 43-49

14 CFR Aeronautics and Space, Vol 2, Chapter I, Subchapter D, Part 65 Certification: Airmen Other Than Flight Crewmembers

14 CFR Aeronautics and Space, Vol 3, Chapter I, Subchapter H, Part 145 Repair Stations

2.2 *FAA Standards:*[3]

Civil Aeronautics Manual (CAM) 18 Maintenance, Repair, and Alteration of Airframes, Powerplants, Propellers, and Appliances, dated 12/15/1959

Civil Air Regulations (CAR) 3 Airplane Airworthiness - Normal, Utility, Acrobatic, and Restricted Purpose Categories, dated 5/15/1996, including Amendments 3-1 to 3-8

AC 25.571-1( ) Damage Tolerance and Fatigue Evaluation of Structure

AC 43-210( ) Standardized Procedures for Obtaining Approval of Data Used in the Performance of Major Repairs and Major Alterations

AFS-300 Major Repair and Alteration Data Approval Online Job Aid[4]

Order 8110.46 Major Alterations that Require Supplemental Type Certificates, dated 9/30/2002, Cancelled[5]

Order 8300.16 Major Repair and Alteration Data Approval, dated 4/18/2014, including Change 1, dated 12/7/2015

Order 8900.1 Flight Standards Information Management System (FSIMS)

FAA Special Policy on Addressing New Technology as Applicable as Valid

[1] This guide is under the jurisdiction of ASTM Committee F39 on Aircraft Systems and is the direct responsibility of Subcommittee F39.02 on Inspection, Alteration, Maintenance, and Repair.

Current edition approved Dec. 1, 2018. Published January 2019. DOI: 10.1520/F3361–18E01.

[2] Available from U.S. Government Publishing Office (GPO), 732 N. Capitol St., NW, Washington, DC 20401, https://www.govinfo.gov/app/collection/cfr.

[3] Available from Federal Aviation Administration (FAA), 800 Independence Ave., SW, Washington, DC 20591, http://rgl.faa.gov.

[4] As published by AFS-300, https://www.faa.gov/about/office_org/headquarters_offices/avs/offices/afx/afs/afs300/.

[5] Used as reference for 6.2.2 through 6.2.2.6 inclusive.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. United States

## 3. Terminology

3.1 *Definitions:*

3.1.1 *accepted practices, n*—practices demonstrated to conform to standards developed for or used by, or both, the aviation industry.

3.1.2 *alteration, n*—any appreciable change in the design of an airframe, powerplant, propeller, or appliance.

3.1.3 *altered state, n*—the documented state of the airframe, powerplant, propeller, or appliance prior to applying this standard (for example, performing the alteration).

3.1.3.1 *Discussion*—This includes all changes that have been incorporated since the issuance of its original airworthiness certificate.

3.1.4 *appreciable change, n*—a change that is large enough to be noticed using an appropriate unit of measure.

3.1.4.1 *Discussion*—With modern technology, all changes could be measured, for example, increased weight, thickness, dimensions, etc., which is not the intent of this definition.

3.1.5 *article, n*—a material, part, component, process, or appliance. **(14 CFR Part 21)**

3.1.6 *complex special process, n*—a process that, if not properly performed, has a significant adverse effect on the integrity of the product.

3.1.7 *elementary operations, n—in the context of maintenance or alteration*, when:

*(1)* The operation, procedure, or action is clearly defined;

*(2)* Housing, facilities, equipment, and tooling are sufficient to perform the operation, procedure, or action;

*(3)* Proper training and qualifications to perform the operation, procedure, or action are established and accomplished; and

*(4)* The operation, procedure, or action is controlled to consistently yield a measurable standard.

3.1.8 *initial installation, n*—the installation of an article that is new to the aircraft where one was not previously installed.

3.1.9 *major alteration, n*—an alteration not listed in the aircraft, aircraft engine, or propeller specifications that *(1)* might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness; or *(2)* is not done according to accepted practices or cannot be done by elementary operations. **(14 CFR Part 1)**

3.1.10 *minor alteration, n*—an alteration other than a major alteration. **(14 CFR Part 1)**

3.1.11 *product, n*—an aircraft, aircraft engine, or propeller. **(14 CFR Part 21)**

3.1.12 *repair, n*—restoration of airframe, powerplant, propeller, or appliance to a condition for safe operation after damage or deterioration. **(CAM 18.1, Definitions)**

3.1.13 *replacement, n*—removal of one previously installed make and/or model with a different make and/or model article.

3.2 *Abbreviations:*

3.2.1 *ACO*—Aircraft Certification Office (FAA)

3.2.2 *ASE*—Aviation Safety Engineer (FAA)

3.2.3 *ASI*—Aviation Safety Inspector (FAA)

3.2.4 *DAR*—Designated Airworthiness Representative (an FAA designation)

3.2.5 *DER*—Designated Engineering Representative (an FAA designation)

3.2.6 *FSDO*—Flight Standards District Office (FAA)

3.2.7 *ODA*—Organization Designation Authorization (an FAA designation)

3.2.8 *OEM*—Original Equipment Manufacturer

3.2.9 *STC*—Supplemental Type Certificate

3.2.10 *TC*—Type Certificate

## 4. Summary of Guide

4.1 This guide describes a procedure for evaluating and categorizing alterations as minor or major, thus determining the appropriate means of approval. (See Fig. 1.)

## 5. Significance and Use

5.1 To standardize applications of CFR Title 14, as applicable.

## 6. Procedure

6.1 Applicant begins process.

6.2 Applicant defines scope of alteration.

NOTE 1—Take steps to ensure this change is an alteration, not a repair. Refer to Section 3, Terminology.

6.2.1 Is the scope of the alteration sufficient to process as a major change in type design (14 CFR 21.93)?

6.2.2 A major change in type design is defined as a change that has an appreciable effect on the certificated weight, certificated balance, structural strength, reliability, operational characteristics, or other characteristics affecting the airworthiness of the product.

6.2.2.1 *Certified Weight and Balance*—Examples of alterations that may appreciably affect the Certified Weight and Balance include, but are not limited to:

*(1)* Changes that increase the certificated maximum weight limits (increases in the maximum gross weight, maximum take-off, or landing weights).

*(2)* Changes in the certificated center of gravity range limits (for example, decreasing the forward limit or increasing the aft limit).

6.2.2.2 *Structural Strength*—Examples of alterations that may appreciably affect structural strength include, but are not limited to:

*(1)* Changes to primary structures (structure that carries flight, ground, or pressure loads as defined in AC 25.571-1.

*(2)* Substituting an engine, propeller, rotor, or airframe primary structural materials (such as replacing a reciprocating engine with a turbine engine or increasing horsepower output by 10 % or more).

6.2.2.3 *Reliability*—Examples of alterations that may appreciably affect reliability include, but are not limited to:

*(1)* Changes to manifolding, air induction systems or air intake doors, engine cowling or baffle that affect the flow of engine cooling air and carburetor/fire ignition heat rises.

iTeh Standards (https://standards.iteh.ai) Document Preview
ASTM F3361-18e1
https://standards.iteh.ai/catalog/standards/sist/b712baee-3689-46e1-9d1e-8eb72f4da1dd/astm-f3361-18e1

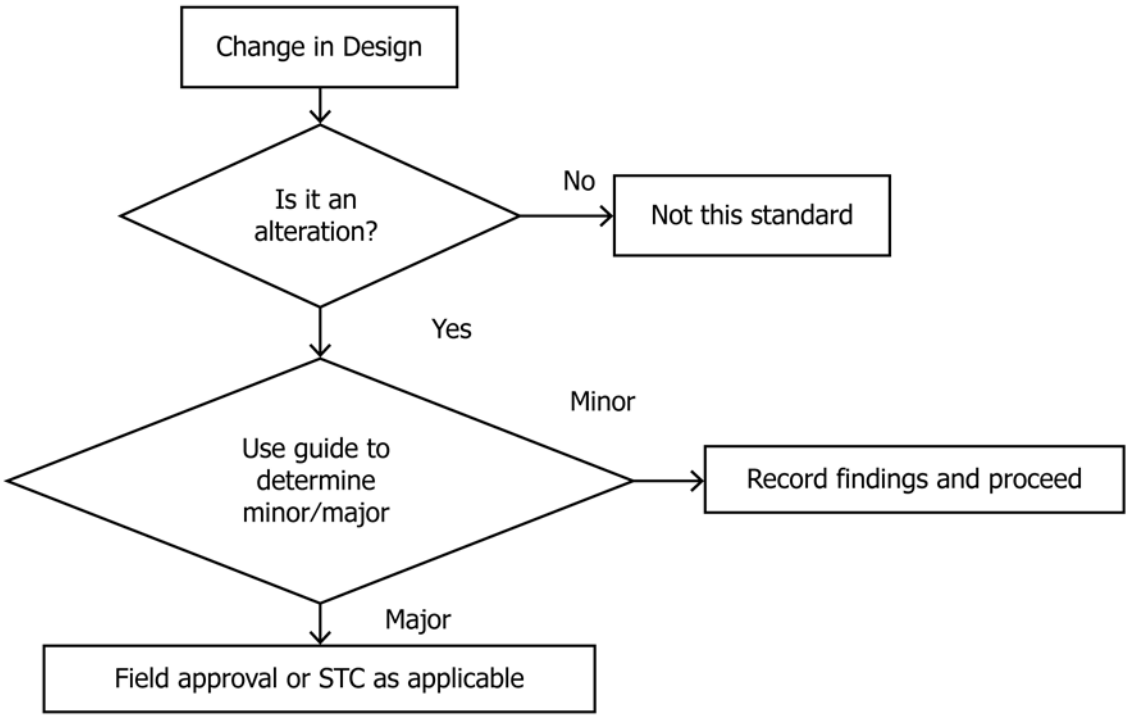


**FIG. 1 Evaluating and Categorizing Alterations**

iTeh Standards (https://standards.iteh.ai) Document Preview

*(2)* Changing the basic engine or propeller design, controls, and operating limitations.

*(3)* Changes that include engine/propeller adjustments and setting limitations that affect power output.

*(4)* Modifications to approved avionics equipment that affect reliability or airworthiness, such as changes:

*(a)* Deviating from the design environment performance.

*(b)* Deviating from the component manufacturers operating limitations.

*(c)* To software. (Note that Changes to Software refers to modification of the code, not of doing an OEM approved software update or revision.)

*(d)* To wire shielding that may affect High Intensity Radiated Fields (HIRF) and Electromagnetic Interference (EMI).

6.2.2.4 *Operational Characteristics*—Examples of alterations that may appreciably affect operational characteristics include, but are not limited to:

*(1)* Changes or relocation of systems (including hydraulic, oil, and fuel systems) and equipment that affects structural integrity, flight, ground handling characteristics, or noise/acoustics of the aircraft.

*(2)* Changes that alter the movable control surfaces that affect the dynamic or static balance, or both, alter the aerodynamic contour of movable control surfaces, or change the weight distribution.

*(3)* Changes in control surface travel, control system mechanical advantage, location of control system component parts, or direction of motion.

*(4)* Changes in basic dimensions or external aerodynamic contour/configuration of the aircraft such as wing and tail planform or incidence angles, canopy, cowlings, contour or radii, the location of wing and tail fairings, winglets, wing lift struts, tiptanks, windows, and doors.

*(5)* Installation of support structure for appliances, or support structure and appliances, to the exterior (that is, night sun beacon, camera, spray/dusting equipment) on rotorcraft only.[6]

*(6)* Changes to flight-critical electrical/electronic systems such as electronic flight controls or the engine control system, Full Authority Digital Engine Control (FADEC), fly by wire, and so forth.

*(7)* Changes that affect aircraft performance, drag, engine power, revolutions per minute (r/min), or exhaust muffler.

*(8)* Changes affecting noise or flight characteristics.

*(9)* Rotorcraft items, such as external search lights, skis, baskets, and so forth.[6]

*(10)* Changes that increase the operational limits (maximum speed limits such as VA, VFE, VNE; minimum speed limitations such as stall speed; increases in service ceiling, and so forth).

6.2.2.5 *Airworthiness*—Examples of alterations that may appreciably affect the airworthiness include, but are not limited to:

*(1)* Changes to landing gear and related components, such as internal parts of shock struts, length, geometry of members, changes to brake and brake systems, or additions.

*(2)* Changes to systems that affect aircraft airworthiness, such as:

*(a)* Relocation of exterior fuel vents or battery vents.

[6] Not applicable for this product in this guide at this revision, but may be addressed in later revisions.

*(b)* Crew or passenger liquid oxygen (LOX) or on-board generating systems.

*(c)* External critical access doors, Auxiliary Power Unit (APU) ram air, nacelle blowout doors, fuel drain.

*(3)* Major deviations to STCs.

*(4)* Changes to oil, hydraulic, pneumatic, and fuel lines or systems that affect their operation or installation and flammability requirements, such as:

*(a)* New types of hoses or hose fittings, or both, that may not meet installation requirements such as flow rate and flammability requirements.

*(b)* Changes to fuel dump valves.

*(c)* New oil/fuel/hydraulic line materials or sealants.

*(d)* Change to, or addition of, permanent fuel tanks or fuel system components.

*(5)* Changes in fixed fire extinguisher or detector systems that affect system effectiveness or reliability, such as:

*(a)* Relocation of discharge nozzles, detector units, or fixed fire extinguisher bottles.

*(b)* Using new or different detector components.

*(c)* Decreasing the amount or changing the type of extinguishing agents.

*(6)* Changes that include the substitution of engine/APU/propeller/airframe materials that affect structural integrity, lightning protection, flight characteristics, or noise/acoustics.

*(7)* Any other complex special process that, if not properly performed, has a significant adverse effect on the integrity of the product.

*(8)* Major alterations to propellers.

6.2.2.6 *Crashworthiness*—Examples of alterations that may appreciably affect crashworthiness include, but are not limited to:

*(1)* Changes to the aircraft structure, cabin interiors, or equipment relocation.

*(2)* Changes that increase the certificated seating capacity, excluding sport parachute jumping configuration.

*(3)* Changes that include the substitution of engine/propeller/airframe materials that affect fire protection, lightning protection, or flammability.

6.2.2.7 Other alterations that may require an STC are described in AFS-300 Job Aid.

6.2.3 If the answer to any of the above is yes,

6.2.3.1 Consider the modification as a major change in type design.

6.2.3.2 Applicant applies for STC or TC amendment.

6.2.3.3 End of process STC is required.

6.2.3.4 If no, continue.

6.2.4 Is this a major alteration?

6.2.4.1 Major alteration means an alteration not listed in the aircraft, aircraft engine, or propeller specifications:

*(1)* That might appreciably affect weight, balance, structural strength, performance, powerplant operation, flight characteristics, or other qualities affecting airworthiness; or

*(2)* That is not done according to accepted practices or cannot be done by elementary operations.

NOTE 2—This definition is copied from 14 CFR 1.1.

6.2.4.2 *14 CFR 43 Appendix A to Part 43 Major Alterations, Major Repairs, and Preventive Maintenance Major Alterations:*

*(1) Airframe Major Alterations*Alterations of the following parts and alterations of the following types, when not listed in the aircraft specifications issued by the FAA, are airframe major alterations:

*(a)* Wings.

*(b)* Tail surfaces.

*(c)* Fuselage.

*(d)* Engine mounts.

*(e)* Control system.

*(f)* Landing gear.

*(g)* Hull or floats.

*(h)* Elements of an airframe including spars, ribs, fittings, shock absorbers, bracing, cowling, fairings, and balance weights.

*(i)* Hydraulic and electrical actuating system of components.

*(j)* Rotor blades.[6]

*(k)* Changes to the empty weight or empty balance which result in an increase in the maximum certificated weight or center of gravity limits of the aircraft.

*(l)* Changes to the basic design of the fuel, oil, cooling, heating, cabin pressurization, electrical, hydraulic, de-icing, or exhaust systems.

*(m)* Changes to the wing or to fixed or movable control surfaces which affect flutter and vibration characteristics.

*(2) Powerplant Major Alterations*The following alterations of a powerplant when not listed in the engine specifications issued by the FAA, are powerplant major alterations.

*(a)* Conversion of an aircraft engine from one approved model to another, involving any changes in compression ratio, propeller reduction gear, impeller gear ratios or the substitution of major engine parts which requires extensive rework and testing of the engine.

*(b)* Changes to the engine by replacing aircraft engine structural parts with parts not supplied by the original manufacturer or parts not specifically approved by the Administrator

*(c)* Installation of an accessory which is not approved for the engine.

*(d)* Removal of accessories that are listed as required equipment on the aircraft or engine specification.

*(e)* Installation of structural parts other than the type of parts approved for the installation.

*(f)* Conversions of any sort for the purpose of using fuel of a rating or grade other than that listed in the engine specifications.

*(3) Propeller Major Alterations*The following alterations of a propeller when not authorized in the propeller specifications issued by the FAA are propeller major alterations:

*(a)* Changes in blade design.

*(b)* Changes in hub design.

*(c)* Changes in the governor or control design.

*(d)* Installation of a propeller governor or feathering system.

*(e)* Installation of propeller de-icing system.

*(f)* Installation of parts not approved for the propeller.

iTeh Standards
(https://standards.iteh.ai)
Document Preview
ASTM F3361-18e1